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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/765,521	01/18/2001	Mark A. Lemkin	IMIN-01008US1	9535

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EXAMINER	
BELLAMY, TAMIKO D	
ART UNIT	PAPER NUMBER
2856	

DATE MAILED: 11/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/765,521	LEMKIN ET AL.	
	Examiner	Art Unit	
	Tamiko D. Bellamy	2856	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 15 August 2003.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-8,13-22,24 and 25 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-8, 13-22, 24, and 25 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

1. Amendment dated 8/15/03 has been received and entered. Claims 9-10, 12, and 23 have been canceled. Claims 1-8, 13-22, 24, and 25 are currently pending. Claims 26-46 are withdrawn from consideration.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-6, 8, 11, 17- 22, 24 and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Chu et al. (6,301,965).

With respect to claims 1 and 2, Chu et al. discloses, in Figs. 3 and 6, that the sensitivity of the MEM accelerometer (10) is increased by ganging the various electrodes (30, 32, 36) (col. 8, lines 45- 47). Chu et al. further discloses an amplifier (18) that is connected to stationary electrodes (30, 32) via a pair of digital transistor switched (44). Chu et al. also discloses the feedback signal can be applied to electrodes (30, 32) through another pair of digital switches (54) (col. 9, lines 43-51), a digital feedback control circuit 14 (col. 5, line 56), and <u>a pair of oppositely connected single-proof-mass</u> (34) (col. 13, lines 50-64). The use of the amplifier (18) is inherently a differential charge integrator as claimed. As depicted in fig. 6, each of the proof masses (34) contain a first independent terminal **(note: <u>one end of a terminal is attached to a contact pad at to right</u>**

lower/upper side of proof masses (34) and the other node of terminal is attached to switch (56, 60)), and a second independent terminal (e.g., ganging of electrodes (30, 32, 36)) on the common substrate (16) **(see col. 13, lines 50-64)** . Furthermore, both proof masses (34) are contained within accelerometer structures (12) having a cavity (24).

With respect to claim 3, Chu et al. discloses in Figs. 1, 2C and 2D, and 6 a series of timing diagrams for operating the single-proof-mass MEM accelerometer (col. 5, line 19), the amplifier 18 senses the capacitively generated from the stationary electrodes (30, 32) (col. 8, lines 61-63), and a first sensing time interval and a second sensing time interval (col. 9, lines 1-5). As shown in Figs. 2C and 2D, the amplifier (18) is inherent to senses/operates over a non-overlapping time period as claimed.

With respect to claims 4 and 6, Chu et al. discloses in Fig. 3, the transistor switches are provided in parallel with feedback capacitors (col. 9, line34-35), and the feedback signal can be applied to the electrodes (30, 32) through digital switches 54 (col. 9, lines 47-59). As shown in Fig.3, the feedback capacitors are within a feedback loop, which is inherently a common mode feedback. With further limitations of claim 6, Chu et al. discloses transistor switches are in parallel with the feedback capacitors in each gain stage to reset the gain to zero at the end of each sensing time interval (col. 9, lines 34-37).

With respect to claim 5, Chu et al. discloses an input common-mode amplifier (col. 9, line 16).

With respect to claim 8, Chu et al. discloses by sensing the change in capacitance with the digital feedback control circuit (14), the position of the proof mass (340 can be determined over a period of time to measure acceleration (col. 8, line 42-45), the digital

feedback control circuit (14) operates at a clock frequency 4MHz, and the clock frequency can be selected to be in the range of 1-100 MHz (col. 10, lines 37-43).

With respect to claim 11, Chu et al. discloses in Fig. 5a multi-level comparator (22) can be used to route a fixed value of the feedback voltage to different combinations of stationary electrodes (30, 32) to provide different levels of electrostatic force to urge the proof mass (34) back towards it initial position (col. 13, lines 23-28), and the filtered signal can be used to drive a comparator (22) to generate one of three states (col. 14, lines 30-36).

With respect to claims 17-20, Chu et al. discloses in Fig. 3 and 6 a MEM accelerometer structure (70), the two structures can be located in a common cavity (24) etched into a substrate (16) (col. 13, lines 54-54), the digital feedback control circuit (14) is fabricated on the same substrate (16) as the MEM accelerometer structures (23, 70) (col. 14, lines 51-54), a amplifier 18, and the digital feedback control circuit (14) comprises a negative feedback loop (col. 7, lines 32-34). With respect to further limitations of claim 18, Chu et al discloses the amplifier (18) senses a capacitively generated electrical signal from the stationary electrodes (30, 32) (col. 8, lines 61-63), the amplified signal is filtered by filter 20 (col. 14, lines 19-20), and the and the filtered signal can be used to drive a comparator 22 for providing feedback to electrically control the position of each proof mass 34 (col. 14, lines 30-36). With respect to further limitations of claim 19, as depicted in fig. 6, Chu et al discloses the MEM accelerometer structures (12) are formed from a pair of oppositely pair of oppositely connected single-proof-masses (col. 13, lines 50-54) each containing a sense capacitor. With respect to

further limitations of claim 20, Chu et al. discloses electrodes located on the substrate proximate to each proof mass to capacitively generate an electrical signal indicative of acceleration of the proof mass (col. 3, lines 48-56).

With respect to claim 21, Chu et al. discloses in Fig. 6 the digital feedback control circuit (140 comprises an amplifier (18), a filter (20), and a comparator (22) (col. 8, lines 53-55), and the proof masses 34 are coupled into the amplifier 18 (col. 14, lines 15-16).

With respect to claim 22, Chu et al. discloses in Figs. 3 and 6 the sensitivity of the MEM accelerometer 10 is increased by ganging the various electrodes (30, 32, 36) (col. 8, lines 45- 47).

With respect to claim 24, Chu et al. discloses digital switches (44) are closes to connect the stationary electrodes (30, 32) of each MEM accelerometer structure (12) to the amplifier except during the force feedback time interval (col. 14, lines 4-9).

With respect to claim 25, Chu et al. discloses during the SEN2 (second gain stage (col. 9, line 40)) time interval the amplified electrical signal is filtered by the filter (20) to remove at the resonance-frequency components of the electrical signal produced by the mechanical resonance of each of the proof masses (34) are then integrated (col. 14, lines 18-22).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (6,301,965) in view of Lemkin et al. (6,386,032).

With respect to claim 7, Chu et al. discloses a feedback circuit (14). Chu et al. does not specifically disclose the feedback is frequency multiplexed. However, Lemkin et al. discloses frequency domain multiplexing of capacitor function, may be formed by using different-valued modulation frequencies (col. 6, lines 34-36). Therefore, to modify Chu et al. by employing a feedback is frequency multiplexed would have been obvious to one of ordinary skill in the art at the time of the invention since Lemkin et al. teaches an accelerometer having theses design characteristics. The skilled artisan would be motivated to combine the teachings of Chu et al. and since Chu et al. states that his invention is applicable to accelerometer including a feedback circuit and Lemkin et al. is directed to an accelerometer including a feedback circuit.

6. Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (6,301,965) in view of Lee et al. (6,230, 566).

With respect to claims 13 and 14, Chu et al lacks the detail of a position sense interface with a reference capacitor. However, Chu et al. discloses in Figs. 1 and 6 a digital feedback control circuit (14) (col. 5, line 56), which is equivalent to a position sense interface; a pair of oppositely connected single-proof-masses (col. 13, lines 50-64); and sensitivity of the MEM accelerometer (10) is increased by ganging the various electrodes (30, 32, 36) (col. 8, lines 45- 47). Furthermore, Lee et al. discloses in Figs. 7 and 8 double accelerometers, proof masses (121, 122), a pair of plate type sense capacitors (127, 128); a pair of reference capacitors (133, 134), having electrodes (96-

97), in the substrate (84) (col. 7, lines 12-37). Therefore, to modify Chu et al. by employing a position sense interface with a reference capacitor would have been obvious to one of ordinary skill in the art at the time of the invention since Lemkin et al. teaches an accelerometer having theses design characteristics. The skilled artisan would be motivated to combine the teachings of Chu et al. and since Chu et al. states that his invention is applicable to accelerometer including a position sense interface and Lemkin et al. is directed to an accelerometer including a position sense interface with a reference capacitor.

With respect to claim 15, Chu et al. lacks the detail of a position sense interface including at least one binary weighted capacitor in parallel with at least one reference capacitor. However, Chu et al. discloses the amplifier 18 includes an offset trim for each input (col. 9, lines 19-20). It is well know in the art to use binary weighted capacitors to trim the outputs caused by sense capacitor mismatch. Lee et al. discloses in Figs. 7 and 8 a pair of reference capacitors 133 and 134, having electrodes 96-97, in the substrate 84 (col. 7, lines 12-37). Therefore, to modify Chu et al. by employing a position sense interface including at least one binary weighted capacitor would have been obvious to one of ordinary skill in the art at the time of the invention since Lemkin et al. teaches an accelerometer having theses design characteristics. The skilled artisan would be motivated to combine the teachings of Chu et al. and since Chu et al. states that his invention is applicable to accelerometer including a position sense interface and Lemkin et al. is directed to an accelerometer including a position sense interface with a reference capacitor.

With respect to claim 16, Chu et al. discloses a position detection circuitry. Chu et al. lacks the detail of a charge applied to the position detection circuitry by changing voltage applied to the reference capacitors. Lee et al. discloses in Figs. 7 and 8 double accelerometers, proof masses 121 and 122, a pair of plate type sense capacitors 127 and 128; a pair of reference capacitors 133 and 134, having electrodes 96-97, in the substrate 84 (col. 7, lines 12-37). Therefore, to modify Chu et al. by employing charge applied to the position detection circuitry would have been obvious to one of ordinary skill in the art at the time of the invention since Lemkin et al. teaches an accelerometer having theses design characteristics. The skilled artisan would be motivated to combine the teachings of Chu et al. and since Chu et al. states that his invention is applicable to accelerometer including a position sense interface and Lemkin et al. is directed to an accelerometer including a position sense interface with a reference capacitor.

Response to Remarks

7. Applicant's arguments filed 8/15/03 have been fully considered but they are not persuasive.

With respect to claims 1-8, 13-22, 24, and 25, the applicant agues that Chu et al. does not discloses <u>a first and second decoupled sense capacitors and a first independent terminal on the proof mass and a second independent terminal on the substrate</u>. However, this content was not contained in the previous claims submitted 01/18/01, which was addressed in the previous office action.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tamiko D. Bellamy whose telephone number is (703) 305-4971. The examiner can normally be reached on Monday through Friday 10:00 AM to 7:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on (703) 305-4705. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Tamiko Bellamy

T.B.

November 7, 2003

Hezron E. Wil

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